FAA HUMS CERTIFICAITON

Federal Aviation Administration

Presented to: Heli-Expo – Dallas, TX

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WHAT IS HUMS?

- HEALTH USAGE MONITORING SYSTEM (HUMS): Equipment, Techniques And/Or Procedures By Which Selected Incipient Failure Or Degradation And/or Selected Aspects Of Service History Can Be Determined.

TYPES OF HUMS

- HEALTH MONITORING SYSTEM: Used For Monitoring Health Of Aircraft Parts and/or Systems
- USAGE MONITORING SYSTEM: Used For Monitoring Usage of Aircraft Parts and/or Systems

TYPES OF HUMS
(Usage Monitoring Examples)

- MEASURES FLIGHT SPECTRUM OR DIRECT MEASUREMENTS
- DETERMINES PART EFFECTIVE USAGE HOURS
- DETERMINES REPLACEMENT OF CRITICAL LIFE LIMITED PARTS AND TIME BETWEEN OVERHAULS (TBO)
- CAN EXTEND/SHORTEN LIFE OF CRITICAL PART AND ON TBOs
- Etc.

TYPES OF HUMS
(Health Monitoring Examples)

- MONITOR ENGINE & DRIVE SYSTEM VIBRATION
- ROTOR TRACK & BALANCE DIAGNOSTICS
- MONITOR ENGINE LIMIT EXCEEDANCE DATA
- STRUCTURAL INTEGRITY MONITORING
- Etc.

FAA REGULATIONS

- HUMS Is Not A Required System Per Regulations.
- FAA HUMS AC Provides Guidance For HUMS Installations Via STC, TC.
- AC Requires HUMS Application For Which “CREDIT” Is Sought To Be Validated.
- “CREDIT” Is A HUMS Application That Adds To, Replaces, Or Intervenes In Industry Accepted Maintenance Practice Or Flight Operations

FAA ADVISORY CIRCULAR (AC)

- AC 29-2C & 27-1B, Change 1, Section MG 15: Provides A Method Of Showing Compliance To FAA FAR Regulations.
- AC Developed By Rotorcraft Health Usage Monitoring System Advisory Group (RHUMSAG) Committee
- Committee Members From FAA Certification & Flight Standards, European Joint Airworthiness Authorities (JAA), US & European Industry Groups (AIA & AECMA)

AC 29-2C, SECTION MG-15
Definitions

- END to END
- HUMS
- Credit
- Applications
- Criticality
- Integrity
- Mitigation Action
- Commercial-Off-the-Shelf (COTS)
- Independent Verificaiton Means
- Synthesis

ELEMENTS OF A HUMS

- AIRBORNE DATA ACQUISITION SYSTEM -
  Records Data Such as Pressure Altitude, Engine & Rotor Torque, Indicated Airspeed.
- DISPLAY SYSTEM
  Provides HUMS Related Information to Pilot
- GROUND PROCESSING SYSTEM
  Contains HUMS Processing Algorithms
  Can Consist of COTS Hardware/Software

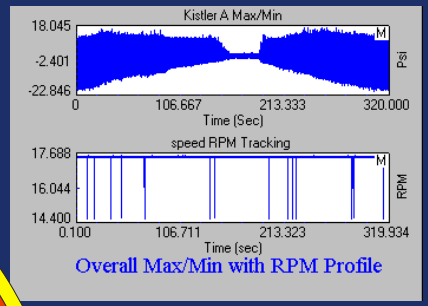
CERTIFICATION APPROACH

Onboard Systems

INSTALLATION

Sensors

Algorithms



CREDIT VALIDATION

Hardware
And
Software

Maintenance and Support System Interface

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

CERTIFICATION APPROACH

- Equipment Installation & Qualification (Airborne & Ground)
  - Allows HUMS Equipment to be Approved for Installation and Begin Credit Validation
  - Must Still Retain Traditional Maintenance Program (I.e. no “Maintenance Credit” provided yet)
- Credit Validation of HUMS
  - Validates That HUMS Functions as Intended
  - HUMS “Credit” Granted Once Completed
- Instructions For Continued Airworthiness (ICA)

CERTIFICATION APPROACH
Equipment Installation/Qualification

- End-To-End Criticality Assessment
- Assessment Shall Consider Safety Effect That The HUMS Application Can Have On The Aircraft (Catastrophic, Hazardous, Major, Minor, No-Effect)
- Equipment Qualification Reqmts. Determined By System Criticality (Hardware & Software)
- Mitigating Actions: Can Result in Modification of Level of Qualification (Mitigating Action: An Autonomous and Permanent Compensating Factor, i.e. Independent Check)

CERTIFICATION APPROACH
Airborne Equipment Qualification

- Hardware Must Address Probability Of Failures And Environmental Considerations
- Use Of Mitigating Actions Allowed for Airborne
- Software Qualified To RTCA/DO-178B, Level Appropriate With HUMS Criticality
- Hardware Environmental Reqmts. in RTCA/DO-160D (Temp., Vibration, Altitude, etc.)

CERTIFICATION APPROACH
Ground Based Equipment Qualification

- May Include COTS Hardware & Software (e.g. PC and Operating System)
  - COTS: Equipment Hardware & Software Not Qualified to Aircraft Standards
- Use of Mitigating Actions Approach Not Applicable to Ground Based Equipment
- HUMS Processing Algorithms Software Qualified to RTCA/DO-178B

CERTIFICATION APPROACH

Ground Based Equipment Qualification

- Independent Verification Means (IVM) Required When Qualifying COTS
- COTS Software Must Have Satisfactory Service History
- Software/Hardware Changes of Selected COTS Must Be Controlled
- HUMS COTS (IVM) Certification Approach Only Applicable To HUMS Ground Based Systems

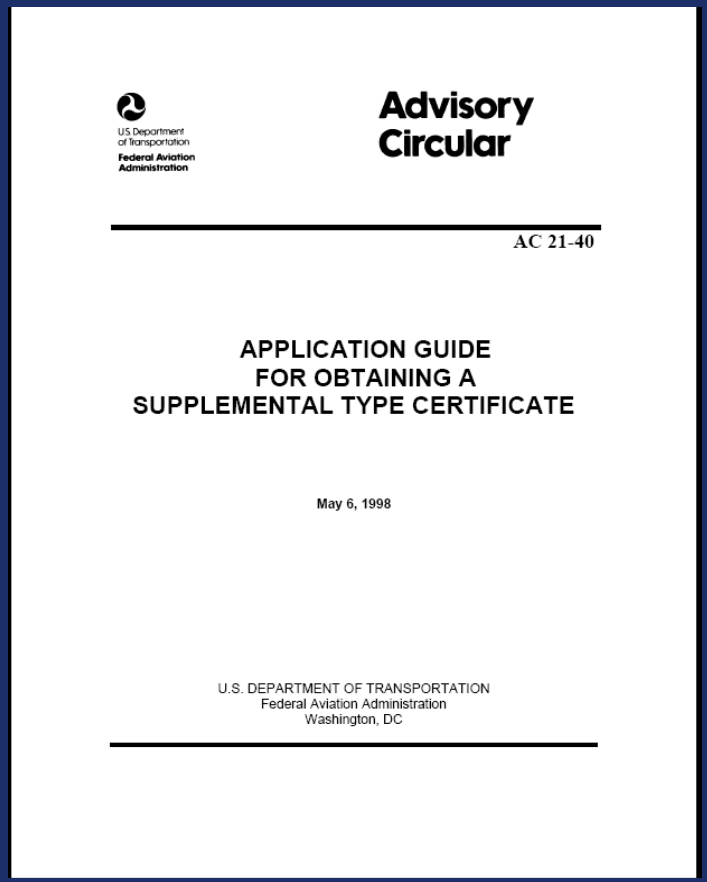
CERTIFICATION APPROACH
Credit Validation

- Description of Application & Associated Credit
- Understanding the Physics Involved
- Validation Methodology
- Introduction to Service
- Continued Airworthiness (Synthesis)

CERTIFICATION APPROACH
ICAs & Other Reqmts.

- **Instructions for Continued Airworthiness (ICA) & Other Requirements.**
  - ICA
  - Operator's HUMS Program,
    - Required If HUMS Approved for “Credit”
  - HUMS Training Program, and
  - Master Minimum Equipment List
    - Allowances are determined based on the criticality of the system.

Supplemental Type Certificate



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

AC 21-40

APPLICATION GUIDE
FOR OBTAINING A
SUPPLEMENTAL TYPE CERTIFICATE

May 6, 1998

U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, DC

AC 21-40

STC APPLICATION GUIDE

QUESTIONS?